PROJECT NUMBER: 1720
PROJECT TITLE: Analytical Microscopy
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I. LOW SIDESTREAM CIGARETTE PAPERS (Sanders)

A. Objective: Characterize the ultrastructural changes that occur in low sidestream (LSS) papers as a function of increasing temperatures.

B. Results: Samples of LSS paper P6SW with 35% $Mg(OH)_2$ and 5% $CaCO_3$ were prepared as outlined by K. Maloney[1] which included heating samples in a controlled environment chamber to 300°C, 350°C - the dissociation temperature of $Mg(OH)_2$, and 378°C - the temperature just prior to structural failure of the paper. These papers, plus one held at ambient conditions, were then photographed by high resolution scanning electron microscopy (HRSEM) and the photomicrographs compared for ultrastructural changes. The photomicrographs revealed no outstanding changes in either the cellulose fibers or the crystalline additives[2].

C. Conclusions: It was theorized that the crystalline additives serve as a protectant to the fiber matrix against combustion. This theory was further established by examining the surface of an ashed paper sample. These photomicrographs showed that fibers that were coated with $Mg(OH)_2$ remained intact. A cigarette which used this paper was then smoked and the ashed paper examined. Again, the $Mg(OH)_2$ seemed to protect the coated fibers. There were little effects of heating noted on those fibers or on the crystalline structure of the coating.

D. Plans: This study showed that HRSEM photomicrograph comparisons of papers held at ambient temperatures vs combustion temperatures can be used to determine if additives serve as protectants to paper fibers and by what manner. Although the original proposal listed several papers to which this technique would be applied[3], they are now no longer under consideration. This technique can be applied to other samples of interest as needed.

E. References:

1. Maloney, K., Driscoll, D., "Temperature Dependent Air Permeation of Cigarette Paper: An Experimental Approach," P.M. Special Report #87-014, 6 February 1987.

2. Sanders, K., "Status Report - Paper Degradation Studies as a Function of Temperature: I. Ultrastructural Characterization," Memo to V. Baliga, 8 July 1988.

3. Baliga, V., "Paper Degradation Studies as a Function of Temperature: I. Ultrastructural Characterization," Memo to R. Cox, 27 October 1987.

II. ART TOBACCOS (Sanders)

A. **Objective**: Determine structural and elemental changes that may occur to Bright thin and bodied, Burley thin and bodied, and Oriental tobaccos both before and after SCE.

B. **Results**: Work was begun on examining the samples by HRSEM. Discussions were held with P. Echlin as to ideas for further study.

C. **Plans**: Complete examination by HRSEM. Prepare samples for further analysis.

D. **References**:

Sanders, K., P.M. Notebook #8612, p. 112.

III. LOW SIDESTREAM CIGARETTE PAPERS - ANALYTICAL SUPPORT (Sanders)

A. **Objective**: Examine the ultrastructure of selected cigarette papers in support of the low-sidestream project.

B. **Results**: Paper samples P8FH and P8GS, both containing 35% $Mg(OH)_2$ and 5% $CaCO_3$, were received to determine if sample P8GS was made by the precipitation method of $Mg(OH)_2$ addition as in sample P8FH or if it was made by the gel method as in sample P6SW. All samples were examined by HRSEM. Sample P8GS was found to be more like sample P8FH than sample P6SW. The $CaCO_3$ crystals in all of the samples were the same. However, the $Mg(OH)_2$ crystals in sample P6SW coated the flax fibers with small, rounded crystals whereas the $Mg(OH)_2$ crystals in papers P8FH and P8GS did not coat the fibers as extensively and tended to aggregate in small clusters. They also tended to be more needle-like in structure. The fibers in both P8FH and P8GS also had a looser weave than those in paper P6SW.

C. **Conclusions**: Paper P8GS was made primarily by the newer precipitation method of $Mg(OH)_2$ addition unlike that used in paper P6SW.

D. **Plans**: Characterize further samples on request.

E. **References**:

Sanders, K., "Comparison of Papers P6SW, P8FH, and P8GS," Memo to B. Goodman, 30 June 1988.

IV. RESPONSE TO ANALYTICAL REQUESTS (Sanders)

A. **Objective**: Provide analytical support to R&D.

B. **Results**:

One customer complaint of a mold like odor and taste noticed while smoking a Marlboro KS was investigated. The filter, paper and filler were analyzed by light microscopy (LM). No mold or other contaminants were noted[1].

Another customer complaint sample of a Va. Slims Lights Menthol 100 HP was investigated for foreign material which might deliver an off odor/taste. No foreign materials were found by LM or SEM[2].

Two metal screens from the Fritsch cutting mill were examined by LM to determine the size of the holes in the screens[3]. Photomicrographs of 12 holes from each sample plus a calibration photomicrograph were made. Sample #1 was found to have a mean hole length of 1.97 mm and width of 1.06 mm. Sample #2 mean length was 2.92 mm and width 1.88 mm. It was noted that there was a substantial amount of what looked like rust on both sides of sample #1 which had altered the size and shape of some of the holes. No rust-like material was noted on sample #2.

C. **Plans**: Characterize further samples on request.

D. **References**:

1. Sanders, K., "Analytical Microscopy Result Form," to J. Shelton, 2 June 1988.

2. Sanders, K., "Analytical Microscopy Result Form," to J. Shelton, 6 July 1988.

3. Sanders, K., "Analytical Microscopy Result Form," to B. Handy, 12 July 1988.

V. SAFETY (Sanders)

A. **Objective**: Provide instruction to ERT members on various aspects of first aid.

B. **Results**: Two presentations were given to ERT and first aid team members. One was given on patient assessment and the other on respiratory assessment and treatment.

VI. MISCELLANEOUS (Sanders)

A. **Results**: A paper has been submitted for publication to the EMSA Bulletin entitled "A Technique to Mount Specimens for SEM."